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THE FOOD VALUE AND USES OF POULTRY.[1]

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CONTENTS.

	Page.		Page.
Introduction	1	Cooking	18
Kinds of poultry	2	Potted and canned poultry	19
Factors which influence table quality	8	Nutritive value of poultry	20
Handling and dressing poultry	10	Cost of poultry	26
Cold-storage poultry	13	Summary	28
Marks of good table poultry	16		

INTRODUCTION.

Among the animal products used for human food few have been longer or more widely known than poultry. The kinds of birds included under the term have naturally varied with time and place. Formerly not only game birds but also small animals, such as rabbits and squirrels, were spoken of as poultry, apparently because they were all sold by one dealer, known as a "poulterer," and because they played very similar parts in the bill of fare. At present the word is commonly and correctly used in a more limited sense to describe birds bred especially for their eggs, flesh, or feathers. This excludes wild birds, even when they are used for food, and also such birds as peacocks and swans when they are bred simply for ornament. On the other hand, when such birds as pheasants or quail are domesticated for table use, or when peafowls and swans are utilized as food, they are properly classed as poultry.

At present the most important kinds of poultry in the United States are chickens, turkeys, guinea fowls, pigeons or squabs, ducks, and geese, while peafowls, pheasants, quail, and swans occasionally

[1] Prepared under the direction of C. F. Langworthy, Chief, Office of Home Economics.

NOTE.—This bulletin brings together general information and summarizes the results of experimenta data regarding the food value of poultry and its uses in the home, together with information on the handling and care of poultry and similar subjects which will prove of assistance in choosing poultry for the home table. It is believed that the material will prove useful especially to housekeepers, extension workers, teachers, and students of home economics.

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come under the same head. Of these, chickens, turkeys, guinea fowls, peafowls, pheasants, and quail belong to the order of Gallinaceæ; pigeons to Columbidæ; and ducks, geese, and swans to Natatores.

Some idea of the extent of the poultry industry in the United States can be obtained from the figures of the last census. Of all the farms giving returns in 1909, 87.8 per cent reported poultry of some kind. The total number of chickens reported was 280,345,133; turkeys, 3,688,708; guinea fowls, 1,765,031; pigeons, 2,730,994; ducks, 2,906,525; and geese, 4,431,980. Although many chickens are kept for their eggs rather than their flesh, nearly all of them are finally eaten, and almost all of the other kinds are bred primarily for the table. Allowing for increased production since the figures quoted were gathered, it is safe to say that 300,000,000 chickens and other poultry, or about three birds to a person, are now consumed in this country every year.

Since poultry is such a general and important branch of agriculture, it is not surprising that a great deal of experimenting has been done and many publications issued regarding the best methods of production and marketing. Comparatively little has been written, however, from the point of view of the consumer, and many, especially those who depend upon markets, could select to better advantage if they had more definite knowledge of the varieties, the ways in which they are bred and marketed, the marks by which their quality is to be judged, their relative value as food, and the ways in which they may be economically used in the ordinary diet. This bulletin, therefore, discusses not only the nutritive value and place of poultry in the diet, but also gives brief descriptions of the varieties and the common methods of producing and marketing, with special reference to the effect of these factors on the table quality and food value of the birds.

KINDS OF POULTRY.

CHICKENS.

Chickens, which are also known as barnyard fowl, have been bred for so long and in so many parts of the world that there is some uncertainty as to where they were first domesticated. It is probable, however, that they are descendants of a wild jungle fowl of Asia.

A good table bird should have a large proportion of flesh to the size of its bones and a large, full breast, on which is found the delicate white meat. Long, thin legs and wings are undesirable, as they contain much bone and little meat. Birds with light-colored feathers are, perhaps, easier than dark ones to make attractive for the market, which demands a skin free from visible pin feathers. Some markets prefer light-skinned and others dark-skinned varieties, though there is no evidence that the color of the skin has any relation to the quality of the birds.

American poultry experts designate as "meat" or "table" breeds the Asiatic class, which includes Light and Dark Brahmas; Buff, Partridge, White, and Black Cochins; and Black and White Langshans. Almost any of the heavy breeds can, however, be made into good table birds if given proper feeding and care.

Ordinarily, the poultry raiser depends on eggs as well as on table birds for his profit, and selects free-laying, well-shaped, hardy varieties, relying on care and feeding to develop the quality and flavor of the flesh. Plymouth Rocks, Wyandottes, Rhode Island Reds, and Orpingtons are probably the most satisfactory of the common breeds used in this country for "general purpose" birds.

Hens lay most abundantly in the early spring and summer, and hence the best season for "spring" chickens and broilers—i. e., chickens from 2 to 6 months old—is from May to September or October. Fowls or hens are, of course, to be had at all times of year, but they are most frequently sent to market in the winter months, when they are laying poorly. The retail market terms for poultry, as for other commodities, vary somewhat with the locality, but, according to well-established commercial usage in the United States, "broilers" is the technical term for the youngest chickens; then come "frying chickens;" then "roasting chickens;" and finally, "hens" or "fowls."

The flesh of the mature cock is usually too tough and highly flavored and requires too much care in cookery to be satisfactory, so caponizing of the young males is often resorted to. Capons rightly fed and handled are considered exceptionally fine for table use. Their flesh has the tenderness of the pullet, with a much better flavor. Moreover, the tender parts of the body develop more than in ordinary chickens, giving a larger proportion of white meat. They are usually higher in price than other forms of chicken, but because their tender flesh is better distributed over the carcass they may be carved and served more economically than chickens of equal weight, and thus be worth a higher price than ordinary chickens, irrespective of their texture and flavor.

Poulards, as the spayed females are called, are seldom found in American markets, though they are often marketed and are highly esteemed in Europe.

TURKEYS.

The name of these birds is rather misleading and does not suggest that they were originally native in America. They were, nevertheless, introduced into Europe from this continent soon after its discovery. The confusion may have been due to the fact that at that time Turkey was vaguely supposed to be the source of all sorts of strange importations; and these new birds were called "Turkey fowl" in the same loose way that maize was called "Turkey corn." The French name

dinde is a corruption of *poule d'Inde* or "hen of India," and suggests that confusion of the East and West Indies may have added to the general misunderstanding. Although they speedily became popular in Europe and are now used there to a considerable extent, they are not so common there as in the United States, where they rank next to chickens in importance.

Turkey flesh resembles that of chicken; it is sometimes described as drier and not so full of flavor, but proper care and feeding lessen these disadvantages. The proportion of meat to bone is larger in turkeys than in chickens, and the fact that their flesh is found in larger masses sometimes makes it possible to serve it to better advantage, especially in the form of "left overs;" hence, pound for pound, turkey is probably utilized more economically than chicken.

There is little demand for young turkey chicks, which are very scrawny and do not bear shipping well. However, in July and August growers near fashionable summer resorts can sometimes sell "broilers" weighing from 1½ to 4 pounds each at rather fancy prices. The general market rarely sees fresh turkeys before September, and the season can hardly be said to begin before the last of October. Many of the birds are fattened to a very large size (25 to 30 pounds) for the Thanksgiving and Christmas trade, but from January until the season for fresh turkeys ends, in late February or March, medium-sized birds are most abundant and are more suitable for ordinary family use. The bulk of our turkey supply now comes from the South, Middle West, and Southwest, but up to January native turkeys, often of excellent quality, are found in Eastern markets. Practically all the turkeys marketed through the spring and summer months are cold-storage birds from the great poultry-raising sections.

GUINEA FOWLS.

The name of these birds rightly indicates the place of their origin, but since they were first found in western Africa by European explorers they have been carried to many parts of the world. They are more generally bred in Europe than in the United States. In the Southern States they are often kept along with the other poultry, and recipes in southern cookery books suggest that the birds are commonly used for food in that part of the country, but it is only within recent years that guinea fowls have been seen in any quantity in northern markets.

Young guinea fowls are sometimes said to resemble partridge in flavor, and older birds, pheasants. The flesh on the breast is slightly darker than in chicken and has a more gamey flavor. In fact, it is this gamey quality which gives them their distinctive value in elaborate menus or among epicures, and to increase it the birds are allowed to hang until just before they begin to "turn." For ordinary

family meals, however, where they are used in the place of chicken or turkey, the fresh flavor is usually preferred.

Young birds are ready for the market in the early autumn, and older birds are to be obtained throughout the winter. A quick method of cooking, such as broiling, develops the flavor of guinea fowl better than such slow ones as boiling or stewing, and hence young, tender-fleshed birds, which can be quickly cooked, are preferable to older ones.

PIGEONS AND SQUABS.

The varieties of pigeons used for food have been developed from the wild blue rock dove but are considerably larger than their wild ancestors. Even so, the breast is the only part of the body on which the flesh occurs in masses large enough to be used to advantage. The breast muscles, which are slightly lighter in color than the rest, are tender before the birds begin to fly, but rapidly toughen with use until in the mature birds they require long, slow cooking to make them edible. Hence, the young, called squabs, are much superior for table use. They are best when about 4 weeks old, that is, after they have begun to grow plump but before they are ready to leave the nest. They are most plentiful in midsummer, but when artificial mating and breeding are practiced they can be obtained the year round, very fine ones often appearing in midwinter. A publication of this department [1] treats of squab raising for market. There is a great demand for squabs by hotels, restaurants, private hospitals, etc., but their cost is usually too high for them to be used frequently in the ordinary family. The older birds are so seldom eaten in the United States that they are almost a negligible quantity in poultry markets and sell for very low prices. In Europe they are much more commonly used, pigeon pie and potted pigeon being forms in which they are considered especially palatable.

DUCKS.

Most of the domesticated breeds of ducks have been derived from the wild mallard. Duck breeding has long been practiced in the Old World, where both meat and eggs are in common use, but until recently they were raised in this country only incidentally by farmers who happened to have access to pond or stream. Of late years, however, the duck-raising industry has been greatly developed, with the result that the birds are much improved in size and quality, and are more commonly eaten than formerly. The egg-laying strains are also attracting attention.

Duck flesh is dark throughout and has a distinctive flavor, generally considered palatable. There is a relatively small proportion of

[1] U. S. Dept. Agr., Farmers' Bul. 684 (1915).

flesh to bone, and the meat occurs in such thin, small masses that only four good table portions can be obtained from a medium-sized bird. Specially fattened ducks carve to better advantage, besides having more tender and delicately flavored flesh.

Young ducks, usually called ducklings, begin to reach the market in May and may be obtained until January. "Green ducks" is a trade name for those appearing in the spring and early summer. Full-grown birds can be obtained at any season but are usually best in winter.

GEESE.

Geese have been used as table birds at least since the days of ancient Egypt. They are common all over the world, but perhaps are most generally raised for market in Germany, where their flesh is prepared in many forms, ranging from plain roast goose to smoked Pomeranian goose breast and "pickled goose" (pökelgans), which is goose flesh treated as we treat soused pork. Goose fat, carefully rendered and preserved, is also much used in Germany. It is eaten on bread in place of butter, and is considered excellent for the preparation of many dishes. Like chicken fat, it is frequently used as a culinary fat by orthodox Jews everywhere. Such uses of poultry fat and other fats have formed a part of the study of fat and its place in the diet, carried on by the Office of Home Economics.[1]

Goose flesh is dark in color and has a propounced flavor, which seems, in part at least, to be due to the fat which permeates it. Special fattening often increases the market value, and very fat "stall-fed" geese are to be found in large poultry markets. In the studies just referred to such a specially-fattened goose was found to weigh 27 pounds, of which nearly 15 pounds was fat, most of it in a thick layer under the skin.

Even more excessive feeding of geese is practiced in certain parts of Europe, notably around Strasburg, Germany, and Toulouse, France, in order to produce fatty infiltration of the birds' livers. These livers, which frequently weigh 3 pounds or even more, are cooked and seasoned according to special and often carefully guarded recipes and sold in the form of potted paste, ordinarily known by the French name of pâté de foie gras (patty of fat liver). The paste has a distinctive flavor much prized by epicures and is used for relishes, sandwiches, and similar preparations, but is too expensive for common use.

For table purposes half-grown or "green" geese are considered most desirable, and may be obtained from May to early winter. Full-grown birds can usually be procured at any season. Geese live to a great age, but after they are 3 years old the flesh toughens and loses its agreeable flavor too much to be good eating.

[1] U. S. Dept. Agr. Bul. 310 (1915).

BIRDS LESS COMMONLY USED AS POULTRY.

There are several kinds of birds which are not bred primarily for their eggs or flesh, but which are, nevertheless, used occasionally for the table, and so should not be entirely overlooked in a description of poultry. The most important of these are peafowl, swan, pheasant, partridge, and quail.

Peafowls were introduced into the Western World from Asia. In classic and medieval times they were considered very delicate eating, the cock, served whole and garnished with his own gorgeous plumage, making the principal dish at many feasts. Peafowls are rare in American markets, though they can usually be obtained on request from a large dealer. In places where they are bred it is sometimes economical and convenient to use surplus birds for the table. There is a large proportion of flesh to bone. Opinions differ regarding the flavor—some consider it dry and tasteless and others think it as delicate as that of pheasants—but all agree that while the young birds, particularly the hen, may offer a pleasing variety in the menu, a mature peacock is not worth eating.

Pheasants have always been considered a delicacy, and now are especially valued for the variety they give to the bill of fare. Their flesh is tender, but has little distinctive taste until it has been kept for some time. The hens are preferred to cocks for table purposes. Most of those seen in American markets have been sent from England or from Russia in cold storage, although the number reared in this country is constantly increasing.

Aside from pheasants, quail and partridge are the principal game birds bred for the table in the United States. There is considerable confusion as to what birds are referred to under these names. The European quail is not found wild in the United States, but several native birds are called quail in different localities, among them the bobwhite and the California quail. Similarly, the word "partridge" may refer to the ruffed grouse, the bobwhite, or the Hungarian partridge (also known as gray partridge), which is being introduced in many game preserves and public reservations. Such birds are bred in captivity for the table to a limited extent, but they have only recently become common in our markets. For a long time to come such domesticated birds will probably be too expensive for common use, though they are sometimes useful to supply variety on special occasions.

Swans were formerly much more commonly used as table birds than at present. Occasionally, when a few are kept among a flock of geese, the young, called cygnets, are killed for eating. Some describe their flavor as delicious, but others consider it too rank.

FACTORS WHICH INFLUENCE TABLE QUALITY.

Desirable quality in the flesh of poultry intended for table use depends on the flavor of the flesh; on its texture, by which is meant the structure of the individual fibers of the muscular tissue and the amount of fat found in tiny particles between them; on the amount of flesh in proportion to the total weight of the bird; and on the distribution of both the flesh and the larger masses of fat over the carcass. These factors in turn depend on several conditions. Besides the general differences between various kinds and breeds of birds, there are differences among birds of the same stock, due to sex, age, exercise, feeding, and methods of handling and marketing, though the natural effect of sex and age is frequently offset by special care and feeding. There is more information available regarding the effect of most of these factors on chickens than on other poultry, but the general principles are probably the same with all.

The effect of sex on table quality is too well known to need long discussion. Other things being equal, the flesh of females is, as a rule, milder in flavor and more tender in texture than that of males. Caponizing makes the flavor of cocks more delicate, tends to produce finer and less tough muscle fibers, and increases the size of the masses of meat, especially in the breast.

Age influences the quality of the flesh in several respects. It tends to increase flavor, at first advantageously, but later usually disadvantageously. Most very young birds have too mild a flavor to be satisfactory. Many persons, for example, consider that the flavor of young chickens such as broilers is not sufficiently developed, and think that the increased richness of taste in birds a year or so old more than compensates for the slight loss of tenderness. On the other hand, the delicacy of flavor is usually lost in decidedly old birds. As the bird grows older, the proportion of flesh to bone usually increases, at least up to the period of full maturity. Often the large masses of flesh found on such birds can be utilized more satisfactorily than the smaller ones found on young and "scrawny" ones.

Exercise affects the flavor and texture of poultry flesh, as it does of any kind of meat. It increases the amount of the protein compounds, known as extractives, on which the specific flavor depends, and it toughens the individual fibers of the flesh and the connective tissue. It further influences both flavor and texture by lessening the amount of fat present, a matter which will be discussed at length in connection with feeding. Exercise may also affect the distribution of flesh on the carcass, increasing especially the naturally strong, tough muscles rather than the less-used, tender ones. In some birds, notably in chickens, the exercise can be more closely controlled than in others, for example, turkeys and guinea fowls, which are put out of condition by long confinement. Almost any poultry, however,

can be safely penned for a few days previous to killing. Regulating exercise is usually closely associated with special feeding. In the special fattening of geese for goose-liver paste (see p. 6), for example, keeping the birds absolutely quiet, sometimes in darkened pens so small that they can not move their wings, is considered as essential as the forced feeding which accompanies it.

The difference between the flesh of a plump chicken and of a lean one of similar kind and age is due principally to the fat present. This fat appears not only in solid masses around the muscles, but also in tiny particles between the fibers of the muscle itself, and these tiny particles make the flavor richer and the texture less close and firm. The skill of the fattener, from the consumer's standpoint, lies not only in producing the desirable amounts of fat at the least expense for food and care, but also in getting the fat well distributed through the flesh rather than merely in masses within the carcass or under the skin. Such large masses have little value for table purposes and unless they are carefully saved and used for cooking they are practically wasted. On the other hand, when the amount of flesh is increased by the fat which occurs between the fibers, the proportion of edible material is increased and the larger masses of meat make better portions in serving.

Besides improving the flavor of the flesh by increasing the fat present, special feed may give specific flavor. Chickens fattened on a mash of grain and milk acquire a delicate flavor, while the "wild" flavor of guinea fowls that find their own food is probably due to the fact that they get a variety of food as they range. The rather rank taste of many water birds has long been believed to be due to the accumulation in their flesh of extractives occurring in the water bugs, fish, and other animal substances which they eat. This theory has been confirmed by recent German work with the European coot, the flesh of which has such a strong flavor and odor that it is usually considered inedible. It was found that these disagreeable qualities are due to monomethylamin, a substance characteristic of the food supply of the birds and similar to one found in decaying meat. It appeared in the skin more than in the flesh, and by removing the former before cooking the disagreeable qualities were largely removed. Special feeding often imparts a very desirable flavor. For instance, canvasback ducks are considered at their best when they have fed on the wild celery characteristic of their favorite feeding ground, and celery and chestnuts are sometimes used to give turkey flesh a special flavor. On the other hand, birds intended for the table should not be allowed to eat onions or wild garlic habitually, because the sulphur compounds in these plants pass over into the flesh and give it a taste which most persons consider undesirable.

The color of poultry flesh, or at least of chicken flesh, may be influenced by the feed. Certain methods of feeding, for example, are based on the fact that milk tends to bleach or whiten the flesh. This matter of color bears little relation to real table quality or nutritive value, and would not need attention except that some markets sometimes demand white and others yellow flesh. These differences are probably the result of old local customs and are fast disappearing now that local-grown poultry is rarely the sole source of supply.

HANDLING AND DRESSING POULTRY.

The way birds are treated from the time the producer considers them ready to be disposed of until they are cooked has almost as much influence on their table quality as their earlier care and feeding. Success in this later stage depends on controlling the changes which take place in the flesh after the birds are killed.

Different methods prevail at different times and places, but however the poultry is handled, cleanliness should be insisted upon everywhere, for both table quality and healthfulness depend upon it in large measure. Dirty pens and runs lead to disease while the birds are alive. After they have been killed cleanliness is equally important, for unless rooms, tables, tools, water, hands—in short, all the articles which come in contact with the birds—are kept in good condition, the flesh is likely to become infected with microorganisms which cause decay and so injure its appearance and flavor. From the point of view of the consumer, dirt in connection with food which is to be cooked is perhaps less dangerous than with something to be eaten raw, but it is nevertheless disagreeable. Moreover, dirt is rightly considered a sign of poor quality in any food material, and it is only just that poultry which shows the marks of careless handling should bring a lower price than clean, attractive-looking birds. By insisting on cleanliness in the poultry and in the markets, the public can help more than is sometimes realized in improving commercial methods, and dealers who try to keep a high standard feel encouraged when their patrons show an intelligent appreciation of their efforts.

MARKETING POULTRY ALIVE.

In the North and West poultry is almost always marketed after killing, but in the South the old custom of marketing birds alive is still common. Birds sent to market alive should be humanely treated. Too close confinement, lack of water, etc., are needless cruelties and injure the appearance and quality of the birds for the table. The purchaser of live poultry often feeds it carefully for a short time to bring it into good condition.

KILLING, PLUCKING, AND COOLING.

According to recommendations made by the Department of Agriculture,[1] it is well to make the bird fast for 12 hours or more before it is killed in order that its crop may be empty and the other organs as free as possible of fecal substances. One of the most satisfactory and humane ways to kill a bird is to hang it head downward and cut the main veins in the neck at the base of the skull, so that quick bleeding is assured. Just as soon as the veins are cut the brain should be pierced with a sharp, stiff, slender knife, to kill the bird and cause the feathers to loosen. If the proper areas in the brain are destroyed by the knife thrust, the feathers may be plucked easily and without tearing the skin. A common way of loosening them is to plunge the carcass into water heated nearly to the boiling point, but this destroys the natural appearance of the skin and also increases the chances of decomposition.

Unless a bird is to be cooked at once it should be put in a cool place where it will lose its animal heat rapidly. Sometimes freshly plucked birds are put into cold water for a short time, with the double purpose of cooling them and making them look plumper. However, such soaking injures the keeping qualities, and if the birds are kept in water until they swell beyond their natural size and weight the practice is fraudulent as well as injurious. A still more objectionable way of plumping birds is by blowing them out. This is bad enough when a bellows is used, but when, as is sometimes the case, the dresser blows directly from his mouth, it is disgusting and dangerous.

DRAWN AND UNDRAWN POULTRY.

One of the much-debated questions among poultry dealers and consumers is whether or not birds keep better when marketed drawn (i. e., with the internal organs removed) or undrawn. Practice varies in different localities. Opening the body and removing the viscera undoubtedly exposes the internal surface to the air, which always contains microorganisms, and thus may hasten decomposition; but, on the other hand, it must be remembered that the viscera decompose more rapidly than other parts of the body, and if left in it may taint or infect the rest of the bird. It is sometimes argued that the contents of the intestines of undrawn poultry may injure the flesh, because dissolved bodies of undesirable flavor can pass through the intestinal walls into the surrounding tissue, but this danger is largely avoided if the bird is starved for a day before killing.

In elaborate experiments with drawn, partially drawn, and undrawn poultry, conducted by the Bureau of Chemistry of this department,[2] it was found that undrawn birds spoil least quickly, and

[1] U. S. Dept. Agr., Bur. Chem. Circ. 61 (1915), rev.
[2] U. S. Dept. Agr., Bur. Chem. Circ. 70 (1911).

partially drawn ones less quickly than the fully drawn ones from which not only the viscera but also the heads and feet have been removed.

For household use it may be safe to let the local farmer or the marketman draw the birds just before they are delivered, providing they are to be cooked within a few hours, but otherwise it is probably best to draw them at home. In no case should the interior of the bird be washed until just before cooking, for the moisture which would necessarily remain would be favorable to the growth of injurious microorganisms to the meat and would be more dangerous than anything the washing might remove. Another disadvantage of buying birds drawn is that it is more difficult to judge the age and freshness of the bird when the head, feet, and intestines have been removed. (See p. 16.)

The head and feet, usually considered as waste in this country, are commonly used in Europe for gravy or soup making and are occasionally sold for this purpose in the United States. The masses of fat such as are found around the entrails are sufficiently valuable for culinary purposes to be sold in some markets for as much as 50 cents a pound at retail. The giblets or edible entrails (gizzard, heart, liver, and sometimes lungs) are often cooked and used in stuffing or gravy. Chicken livers are considered a great delicacy by many and bring high prices when sold separately. If any of these parts are removed and kept by the marketman, allowance ought to be made in the price. The inedible entrails, on the other hand, have no value to the housekeeper and should be disposed of at once, as they spoil quickly and taint whatever they come in contact with.

CHANGES IN POULTRY FLESH.

After the animal heat leaves the body, a condition known as "rigor mortis" sets in, which stiffens the flesh and tendons. After some hours, however, this stiffness begins to pass off, probably as the result of the growth of microorganisms or the action of natural ferments in the flesh. Because of this, poultry should either be cooked within a few hours after killing or else kept for a day or two. Along with this softening of the flesh and tendons, other changes also take place which, when they have become more apparent, are called decomposition or putrefaction. In their later stages they are accompanied by a characteristic odor and a disagreeable, acid taste, and sometimes by a change of color. The younger the bird and the softer and moister the flesh the more rapidly does this decomposition set in. The microorganisms which produce these undesirable chemical changes in flesh grow more quickly at a moderately high temperature than at a low one, and in a damp place than in a dry one, and the meat must, therefore, be stored in a cool, dry place. Clean-

liness in surroundings, in handling, and in everything else concerned is essential, for dirt introduces microorganisms which cause decay. Ordinarily poultry will remain sweet for a week or more at a temperature of 50° F., but if it is to be kept longer it must be stored in a dry place at a temperature no higher than 34° F., which, except in winter weather, means in artificial cold storage.

COLD-STORAGE POULTRY.

In former times every family in the country either raised its own poultry or obtained it from some neighbor, while town and city dwellers bought theirs direct from a farmer or from a retail market which received it direct from the farm. Such local supplies can still be obtained in many rural districts and small cities, and to a limited extent in large cities; and provided that the grower cares for the birds properly, this direct method of marketing probably brings the birds to the household in the freshest possible condition. For a long time, however, the farms within easy driving distance of the larger cities have not been able to supply all the poultry needed and birds have been shipped in from long distances. To what extent our markets are dependent upon poultry from a long distance may be seen from the last census, which shows that over half of the poultry used in the United States is produced in only 10 States, most of them in the central groups. Of course, this change in the poultry supply could not have taken place without a corresponding development of refrigerating machinery and methods of transportation, which has made it feasible to ship fresh birds for hundreds of miles and to hold them for market in good condition for a length of time which would have been impossible not many years ago.

The whole cold-storage business has developed so rapidly during the last 20 years that the public still has rather vague ideas regarding many features of it. As far as poultry is concerned, chickens make up by far the largest part of the total amount handled, but large quantities of turkeys and a limited number of ducks, geese, and other birds are also stored. The methods of treating the different varieties are fundamentally the same.

It is hardly surprising that there is a good deal of confusion as to exactly what is meant by cold-storage poultry, for very few definitions or standards have been set up to describe it in different States, and those that have been adopted are often conflicting. It has been suggested that the term "cold-storage poultry" be used to describe all poultry which has been kept for more than 30 days at a temperature below 45° F. If such a definition were legally adopted, the practical effect would be that no birds which had been kept for more than a month could be sold as fresh. To a person accustomed to think of fresh poultry as that which has been kept for a few days

only, even 30 days might seem a long time. But it should not be forgotten that with the best modern methods of refrigeration poultry several weeks old reaches the consumer in better condition than some only a few days old which has not been properly cared for.

Until some definite standard for fresh and cold-storage poultry is generally adopted it will be easier for the ordinary retail buyer to understand what is being offered if he realizes that there are two general methods of marketing birds from cold-storage warehouses. One deals with those which are expected to reach the consumer within a few weeks and which are known to the trade as fresh poultry, and the other with birds which are to be held in cold-storage warehouses for some time, usually until the fresh supply runs low again, and which are often called frozen poultry.

The so-called "fresh" poultry, from typical large, well-equipped establishments where the birds are bought alive and specially fattened at the shipping plant, is killed by cutting the main veins of the neck and pricking the brain, is hung head downward to drain, and is plucked without scalding. It is then hung on special racks in a chill room, where it is kept for at least 24 hours, usually at a temperature between 35° and 30° F. For long journeys in hot weather the birds are sometime frozen stiff at a much lower temperature. The next step in the process is packing, which should be done at about the same temperature as the chilling. The birds are graded according to size and quality and are usually packed in uniform boxes with not more than 12 birds to a box. Birds of the best quality are sometimes separately wrapped in parchment paper and packed in cartons holding only a pair. Such separate packing not only prevents the birds from losing shape and from rubbing against each other, but also keeps the flesh from becoming too dry.

Frequent changes of temperature seem to increase the rate at which the undesirable microorganisms develop in the flesh of poultry, and hence such variations are avoided as much as may be both in the storehouse and during transit. The special refrigerator cars designed for shipping such produce as poultry, with their insulated walls and their ice bunkers for use when the outside air is warm, make it possible for the 10,000 to 20,000 pounds of poultry which constitute a carload to travel literally from one end of the country to the other without having the temperature vary more than five degrees.

Under the present conditions of marketing, poultry may have to pass through the hands of several dealers—wholesaler, commission man, retailer, etc.—before it reaches the consumer, and it is almost impossible to prevent its becoming more or less warm during the various transfers. In order to reduce such changes as much as possible the stock is kept in cold-storage chambers by each dealer,

and progressive retailers sometimes even use refrigerated show cases. The consumer should insist that the birds be kept in a cold place until they are delivered to him, and should use them as soon as possible after they reach his home.

Sometimes, especially in hot weather, poultry which is to be sold as fresh—that is, within a few weeks of killing—is frozen before it is shipped. As a general rule, however, the term frozen poultry is used to describe that which has been held at a very low temperature (sometimes below 0° F.) until the birds are frozen very hard, and which is then stored at a temperature below freezing for several months—sometimes for many months. Dealers with cold-storage warehouses buy up large quantities of chickens when they are most plentiful, freeze them, and carry them over to be marketed during the next off season.

When poultrymen first began to freeze poultry it was claimed that no changes took place in the flesh while it was held at these low temperatures. Experiments conducted by the Bureau of Chemistry of the United States Department of Agriculture under commercial conditions and with the cooperation of poultry warehousemen [1] have not confirmed this. Chemical and bacteriological changes do take place, though they may be too slight to be noted by sight, smell, or touch, even when the carcass is thawed. These changes depend very largely on the way in which the bird was dressed and handled before the freezing, as well as on the length of time it is held in the frozen condition. Most of the objection to the frozen poultry of the past arose from careless preparation for storage and from the refreezing of thawed poultry by poultry dealers. In the past there was also a tendency, when the market conditions were bad, for dealers to freeze "fresh" stock on the verge of decay, that it might not be a total loss. This practice has injured the entire poultry industry because it substituted an article of poor quality for a good one. With the better understanding of cold storage such occurrences are becoming less and less frequent and frozen poultry is, therefore, improving.

The length of time during which poultry properly prepared for storage can be kept hard frozen without injury to quality is fairly well known. Researches in the Department of Agriculture have shown that such birds may be kept for 9 to 10 months and still be not only wholesome but of good table quality. This makes the season for cold-storage birds coincide with the seasons of natural scarcity and insures a continuous supply, especially of younger birds, such as broilers and tender roasting chickens. The change most likely to be noticed in a bird held for a considerable period in cold storage is a loss of juiciness in the flesh, but it is not always easy to detect the difference

[1] U. S. Dept. Agr., Bur. Chem. Circ. 64 (1911).

between the flavor of fresh and of properly handled stored birds. While frozen poultry will keep in good condition for several days after thawing, the flavor is better if the bird is cooked as soon as possible after the frost is out.

The way in which frozen birds are thawed makes a great difference in the length of time they keep in condition. It used to be customary to thaw them by soaking in cold water, but this has been proved undesirable not only because the water is very likely not to be clean, but also because soaked birds "go off" in quality very rapidly. Soaking in hot water, as is sometimes done in market for a "rush order," is even worse. A much better way is to keep the birds for 24 hours at ordinary ice-box temperature (45° to 50° F.). As has been already stated, the sooner the birds are used after thawing, the better, and whenever possible birds should be bought stiff and thawed at home. This means buying poultry a day before it is needed, but it is the surest way of having it properly thawed. In warm weather it should be put in the refrigerator to thaw, but in cold weather a moderately cool room will do as well. If it is impossible to do the thawing at home, the marketman should not be allowed to do it until a short time before delivery.

Although frozen poultry is hardly to be chosen when fresh birds are in the market, it undoubtedly has the advantage of furnishing chickens, turkeys, and other birds when the natural supply is lacking and thus increasing the variety of the meat list. It also does something toward keeping prices more uniform than they would otherwise be.

MARKS OF GOOD TABLE POULTRY.

FRESHNESS.

In a freshly killed bird the feet feel moist, soft, and limber, and if it was dressed with the head on, the eyes look bright and full. As it becomes stale the eyes shrink and the feet dry and harden; when too stale, i. e., when decomposition is well under way, the body turns dark and greenish or becomes slimy. The flesh should be neither flabby nor stiff, but should give evenly and gently when pressed by the finger. It is very difficult to distinguish between good cold storage and freshly killed poultry.

AGE.

One of the commonest ways of testing the age of dressed poultry is to take the end of the breastbone farthest from the head between thumb and finger and attempt to bend it to one side. In a very young bird, say a "broiler" chicken or a green goose, it will be easily bent, like the cartilage in the human ear; in a bird a year or

so old it will be brittle, and in an old bird, tough and hard to bend or break. Unfortunately there are sometimes tricky dealers who break the end of the breastbone before showing the bird, and thus render the test worthless. If the feet are left on the carcass, they furnish a mark of age. In a young bird they are soft and smooth, becoming hard and rough as the bird grows older. The claws are short and sharp in a young bird, growing longer and blunter with age and use. Spurs generally occur on male chickens. On male broilers and tender roasting chickens they are small; on older, higher-flavored ones they are prominent but flexible; on cocks they are long and attached to the bones of the legs; on capons they seldom develop until the second year of age.

Turkeys up to a year old are said to have black feet, which grow pink up to three years old and then gradually turn gray and dull.

The age of pigeons can sometimes be told by the color of the breast, which becomes more and more purplish as the bird grows older. Red feet are also said to be a sign of age in a pigeon.

In ducks and geese the flexibility of the windpipe is a mark of youth. It can be easily squeezed and moved when the bird is young, but later grows rigid and fixed.

Turkeys, ducks, and geese are often marketed with the wing feathers on, while guinea fowl, pheasants, and other game birds are very commonly sold without any plucking. Capons are frequently marketed with the feathers left on head, hackle, saddle, legs, and wings. When the plumage is naturally handsome it adds much to the attractive appearance of the bird. Since laws for the protection of game birds have become more strict the feathers of some kinds of poultry have come to be valued for millinery and other ornamental purposes. Aside from this, they are of aid to the housekeeper because they give a clue to the age of the bird. If the tips of the quills at the end of the wing are sharply pointed the bird is probably young; the blunter they are, the older the bird

SEX.

Commonly it takes a trained eye to distinguish sex in dressed birds, but fortunately this is not important save in the case of capons. When caponizing has been properly done the head is small for the size of the body, the comb and wattles are pale and withered, the body plumper, rounder, and larger than in an ordinary fowl, and the spur abortive. If the operation was incomplete, the head will be like that of an ordinary bird and the body less rounded. Such birds, known technically as "slip capons," are much inferior to true capons.

COOKING.

The purpose of cooking poultry is the same as with any other material, namely, to produce chemical and physical changes which improve the flavor and texture and to destroy any microorganisms which may be present. The heat of cooking softens the fibers and connective tissues which form the greater part of poultry flesh, and thus gives the digestive juices a better chance to act upon them. On the other hand, the protein (nitrogenous substance found in the lean of meat) is hardened by the strong heat, much as white of egg, which it resembles in chemical composition, hardens in boiling. Protein thus hardened or coagulated may be somewhat less readily though not less thoroughly digested than slightly cooked or raw protein; for most persons, however, this disadvantage in the cooked meat is more than offset by what custom makes them consider its more attractive taste and appearance. The fats, too, are affected by the heat; being melted out from the flesh to some extent, they make it appear more juicy.

Boiling, stewing, roasting, broiling, and frying are the methods of cooking ordinarily used with poultry, as with other meats.

In boiling and stewing the heat reaches the flesh through the water in which it is placed, and the chief difference between the two lies in the amount of heat applied at one time. The choice to be made between them should depend on whether the flesh only is to be used or also the water in which it is cooked. If the flesh only, the bird should be boiled; that is, plunged into water which is already at or near the boiling point and allowed to stay at that temperature for from 10 to 20 minutes. This exposure to the greater heat will cause the protein near the surface to harden and form a sort of coating which the juices of the interior can not so readily pass. Later the pot should be set in a cooler place and the meat be left in water slightly below the boiling point until the desired changes have taken place in its inner parts. When, on the other hand, the water also is to be used, the bird should be stewed; that is, put into water while it is still below the boiling point and kept there until thoroughly cooked, since at a moderate temperature no impervious coating of coagulated protein will form, and part of the juices, etc., will escape from the meat into the water.

In roasting and broiling poultry the heat reaches the meat through the air instead of through water. The dry heat causes the protein near the surface to harden, thus partially preventing the escape of the juices; it also causes the meat to brown on the surface, and thus produces a new and appetizing flavor. If recourse is had to basting, or pouring the escaped juices over the hot meat, a coating is formed over the surface, which aids in keeping in the remainder of the juices and increases the "browned" flavor. The larger the fowl, the longer the

time required for the interior to become hot. On the other hand, if the bird is small, there is danger of the interior drying out with prolonged heat, and it should be cooked as quickly as possible. Hence the rule that the smaller the bird the hotter the oven and the shorter the period of cooking should be.

When the layer of meat over the bones is very thin, as in young chicks or squabs, broiling is preferable to roasting. Here very intense heat is applied to one side of the meat until the surface is coated over with coagulated protein, then the other side, and so on alternately until the interior is cooked.

In frying, whether in a pan or in deep fat, the heat reaches the meat through hot fat instead of water or air. Like broiling, this process seems appropriate only for thin pieces of meat. The hot fat on the surface forms a coating which keeps the juices in; or, when the meat is dipped in batter before frying, the latter forms the coating and adds its own browned flavor to the flavor of the meat. The fat should be very hot when the meat is put in, else it may soak into the flesh and spoil the flavor.

Cookbooks and bills of fare suggest almost endless ways of cooking poultry, but it will be found that they all correspond in principle to the methods described and that the differences between them usually lie in the way in which the dishes are flavored by dressing or sauce or in the way they are treated after their first cooking. Chicken pie, for example, is stewed or boiled chicken plus the crust and a little sauce, and chicken croquettes are rather finely divided boiled or roasted chicken plus the seasoning, etc., with which the meat is mixed and the crumbs in which it is rolled before frying. The nutritive value of these dishes depends, of course, on all the materials which go into them.

POTTED AND CANNED POULTRY.

In commercial establishments the meat for these goods is prepared in essentially the same way as if it were to be used immediately, and then is treated much as any other canned meat product, the object being to sterilize the can contents and exclude the air, with the microorganisms always present in it. If sterilization is not complete, there is, of course, danger of decomposition and its attendant evils. Another possible but slight danger is that of poisoning from improper tin and solder, but this is not so great with meats as with fruits and vegetables, in which the acids aid in the formation of dangerous substances. There is no reason why canned poultry, properly put up, should not be just as healthful as fresh, for which it is often a most convenient substitute.

Within the last few years it has become fairly common for housekeepers, especially in rural regions where it is difficult to obtain

butcher's meat, to can meat for home use, just as they do fruits and vegetables. Although beef and pork are most used for this purpose, poultry is also put up with considerable success. The birds are first cooked as if they were to be used at once—sometimes boiled or stewed, sometimes fried or broiled—and are packed in jars or cans much as fruit is. Then they are sterilized by cooking in steam under pressure, either in a special steam cooker or, if this is not available, in an ordinary wash boiler with a tight-fitting cover. If this second cooking is so conducted that the meat is sterilized throughout and the jars are then closed absolutely air-tight, there is no reason why such home-canned poultry should not be perfectly wholesome. If, however, the meat is not heated enough to kill any microorganisms which may have found their way to it, or if there is any chance for others in the air to infect the cooked meat, they may develop in it while it is stored and cause severe poisoning when the meat is used. Experiments are now being made in this office under controlled conditions and with apparatus especially designed to measure interior temperatures in the hope of learning whether or not common household methods of canning heat the food sufficiently to sterilize it entirely.

NUTRITIVE VALUE OF POULTRY.

CHEMICAL COMPOSITION.

The chemical composition of different kinds of poultry and poultry products is given in the table below, which also includes a few other common food materials for purposes of comparison. Data regarding the composition and energy value of poultry are also shown in graphic form in figures 1 and 2.

Average composition of poultry, poultry products, and some other foods.

Kind of food.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value.
CHICKENS.							
Young:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
As purchased	18.8	55.5	17.8	7.2	.....	0.9	615
Edible portion	.....	68.4	21.9	8.9	.....	1.1	760
Meat, not including giblets	.....	66.9	22.6	10.1	.....	1.1	820
Dark meat	.....	70.1	20.8	8.2	.....	1.2	710
Light meat	.....	70.3	21.9	7.4	.....	1.1	700
Meat, visible fat removed	.....	74.5	21.8	2.5	.....	1.1	500
Giblets	.....	71.0	19.8	6.4	.....	1.3	620
Liver	.....	69.3	22.4	4.2	2.4	1.7	620
Heart	.....	72.0	20.7	5.5	.....	1.4	600
Gizzard	.....	72.5	24.7	1.4	.....	1.4	505
Broiler:							
As purchased	29.1	51.2	15.5	3.3	.....	.8	415
Edible portion	.....	69.7	20.7	8.3	.....	1.1	715
Meat, not including giblets	.....	69.2	21.1	8.8	.....	1.1	740
Giblets	.....	72.8	18.7	6.1	.....	1.3	590
Capon:							
As purchased	17.5	46.8	17.7	17.5	.....	1.0	1,035
Edible portion	.....	56.7	21.5	21.2	.....	1.2	1,255
Meat, not including giblets	.....	55.8	21.6	22.1	.....	1.2	1,295
Giblets	.....	63.3	20.5	14.6	.....	1.3	970

Average composition of poultry, poultry products, and some other foods—Continued.

Kind of food.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value.
OTHER POULTRY.							
Turkey:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
As purchased	14.3	49.2	19.0	16.2	.....	1.0	1,005
Edible portion	.....	57.4	22.2	18.9	.....	1.2	1,175
Dark meat	.....	57.0	21.4	20.6	.....	1.1	1,230
Light meat	.....	63.9	25.7	9.4	.....	1.3	850
Giblets	.....	56.7	17.7	23.5	.....	1.2	1,280
Dark meat, cooked	.....	53.7	39.2	4.3	.....	2.2	885
Light meat, cooked	.....	58.5	34.6	4.9	.....	1.8	830
Duck:							
As purchased	15.9	51.4	15.4	16.0	.....	1.1	930
Edible portion	.....	61.1	18.3	19.0	.....	1.3	1,110
Meat, not including breast or giblets	.....	55.5	17.4	26.1	.....	1.0	1,380
Breast	.....	73.9	22.3	2.3	.....	1.3	500
Giblets	.....	73.2	17.9	5.0	.....	1.8	530
Duckling:							
As purchased	16.2	43.3	12.0	28.0	.....	.7	1,360
Edible portion	.....	51.7	14.3	33.4	.....	.9	1,620
Green goose:							
As purchased	12.2	41.9	13.6	31.6	.....	.8	1,535
Edible portion	.....	48.2	15.1	36.0	.....	.9	1,745
Goose:							
As purchased	11.1	48.0	14.8	25.5	.....	1.0	1,310
Edible portion	.....	54.0	16.6	28.7	.....	1.1	1,475
Meat, not including giblets	.....	51.8	16.2	31.5	.....	1.0	1,580
Giblets	.....	70.0	20.1	8.2	.....	1.7	700
Liver	.....	62.6	16.6	15.9	3.7	1.2	1,015
Pigeon:							
As purchased	13.6	55.2	19.7	9.5	.....	1.3	745
Edible portion	.....	64.0	22.8	11.0	.....	1.5	865
Meat, not including giblets	.....	63.2	22.9	12.1	.....	1.4	910
Giblets	.....	68.1	22.2	5.2	.....	2.3	615
Squabs:							
As purchased	15.6	49.0	15.7	18.6	.....	1.3	1,045
Edible portion	.....	58.0	18.6	22.1	.....	1.5	1,240
Meat, not including giblets	.....	56.6	18.5	23.8	.....	1.4	1,310
Giblets	.....	69.8	19.8	7.2	.....	2.0	655
Guinea hen:							
As purchased	16.4	57.7	19.4	5.4	.....	1.1	570
Edible portion	.....	69.1	23.1	6.5	.....	1.3	685
Meat, not including giblets	.....	68.9	23.4	6.5	.....	1.3	690
Giblets	.....	69.9	20.8	7.1	.....	1.3	665
Pheasant:							
As purchased	12.0	61.5	21.5	4.2	.....	1.0	560
Edible portion	.....	69.9	24.4	4.8	.....	1.1	640
Meat, not including giblets	.....	70.0	24.7	4.6	.....	1.1	635
Quail:							
As purchased	10.5	59.0	22.3	6.1	.....	1.4	655
Edible portion	.....	65.9	25.0	6.8	.....	1.6	730
Meat, not including giblets	.....	66.3	25.4	7.0	.....	1.4	745
Giblets	.....	63.0	21.8	6.2	.....	2.3	650
PRESERVED POULTRY MEAT.							
Potted turkey	.....	56.0	17.2	22.0	.....	3.0	1,210
Potted chicken	.....	56.1	19.4	20.3	.....	2.5	1,180
Canned chicken soup	.....	87.1	2.9	3.3	5.1	1.6	280
Canned boned chicken	.....	57.6	27.7	12.8	.....	2.2	1,025
Canned quail	.....	66.9	21.8	8.0	1.7	1.6	755
Pâté de foie gras	.....	41.3	13.6	38.2	4.3	2.6	1,885
OTHER KINDS OF FOOD FOR COMPARISON.							
Beef, sirloin steak, as purchased	12.8	54.0	16.5	16.1	.....	.9	955
Beef, brisket, as purchased	23.3	41.6	12.0	22.3	.....	.6	1,130
Lamb chops, as purchased	14.8	45.3	16.0	24.1	.....	.8	1,275
Mutton, leg, as purchased	18.4	51.2	15.1	14.7	.....	.8	875
Pork, chops, as purchased	19.7	41.8	13.4	24.2	.....	.8	1,230
Pork, salt fat, as purchased	11.2	17.6	7.4	59.6	.....	5.1	2,565
Halibut, fresh, steaks, as purchased	17.7	61.9	15.3	4.4	.....	.9	460
Mackerel, salt, as purchased	19.7	34.8	13.9	21.2	.....	10.4	1,115
Oysters, solid	.....	88.3	6.0	1.3	3.3	1.1	220
Eggs, as purchased	11.2	65.5	11.9	9.3	.....	.9	595
Milk	.....	87.0	3.3	4.0	5.0	.7	315
Butter	.....	11.0	1.0	85.0	.....	3.0	3,490
Cheese, as purchased	.....	34.2	25.9	33.7	2.4	3.8	1,890
Wheat flour	.....	12.0	11.4	1.0	75.1	.5	1,610
Wheat bread, white	.....	35.6	9.3	1.2	52.7	1.2	1,175
Beans, dried	.....	12.6	22.5	1.8	59.6	3.5	1,565
Potatoes, as purchased	20.0	62.6	1.8	.1	14.7	.8	305
Apples, as purchased	25.0	63.3	.3	.3	10.8	.3	215

The nutritive value of any food material as purchased depends not merely on its total composition but on the proportion of edible to inedible material which it supplies.

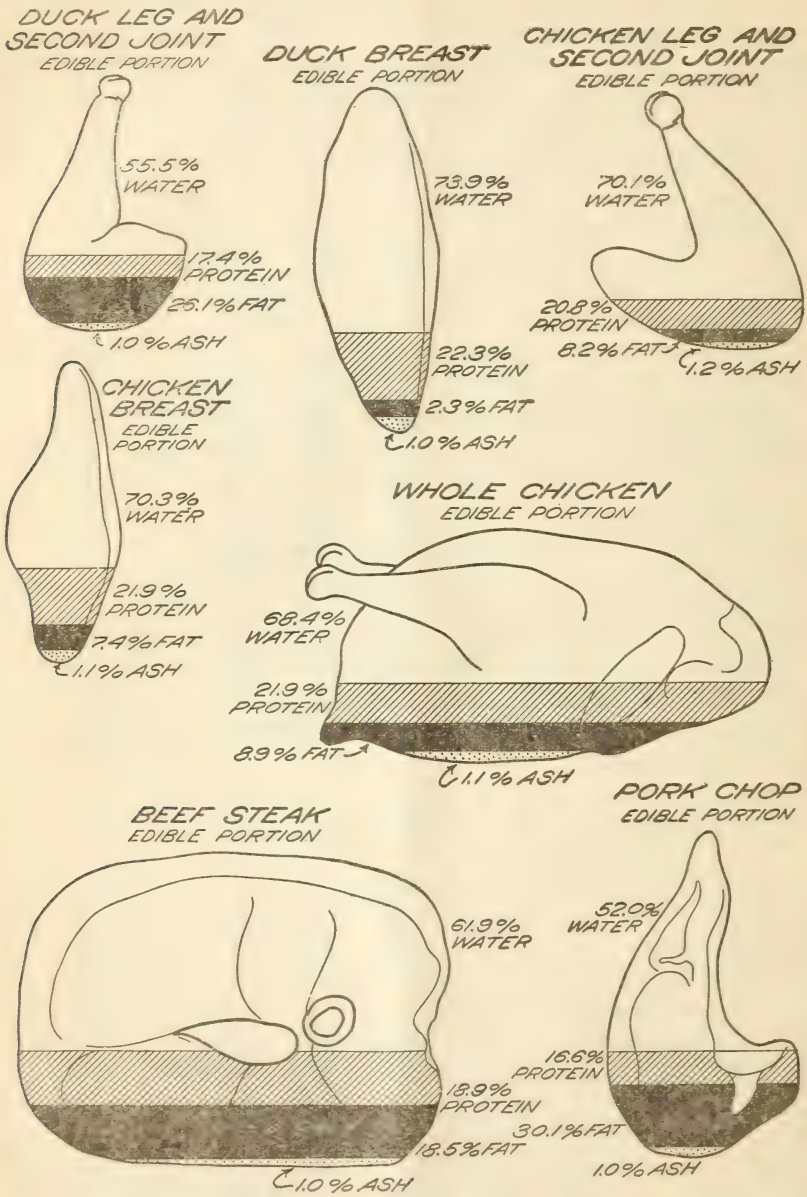

FIG. 1.—The composition of poultry in comparison with other foods.

The edible portion of poultry consists chiefly of the muscular tissue, the fat, and the edible entrails (giblets). Like all meats, it

is made up of water, protein, and fat, with a very small amount of carbohydrates in the form of glycogen, and a small amount of mineral matter, or ash. The nature of these nutrients and the uses to which they are put in the body have been discussed in another publication.[1]

The differences in composition between different kinds of poultry are not very marked. (See fig. 1.) There are fully as great differences between specimens of the same kind of birds at different ages as between different kinds of birds. In general, the younger birds contain larger amounts of refuse and water than the older ones and have a correspondingly low proportion of actual nutrients. Individual birds of any kind or age may vary greatly in the amount of water or fat included in their flesh, and this fact, of course, affects their food value as well as their tenderness and flavor. In spite of all these differences the following figures may be taken as roughly representing the general composition of dressed poultry: The refuse, which includes the head, feet, bones, and inedible entrails, makes up from 15 to 20 per cent, and the edible portion, including the skin, 80 to 85 per cent of the weight of the dressed bird. The edible portion itself consists of 55 to 65 per cent of water, 20 per cent of protein, from 10 to 35 per cent of fat, and 1 to 2 per cent of mineral matter.

In spite of their general similarity there are some characteristic differences in the composition of different kinds of poultry. The light-fleshed birds are richer in protein and poorer in fat than the others. In chickens, and probably in all the light-fleshed varieties, the young birds yield a larger proportion of protein and a smaller proportion of fat than the older ones of the same kind, while in the dark-fleshed varieties, such as duck and goose, the young are richer in fat and poorer in protein.

Some of these differences in composition in the various kinds of poultry are great enough to be carefully considered in planning dietaries. If chicken, with its 8 per cent of fat, were substituted in a menu for green goose, with its 36 per cent, or turkey, with 22 per cent protein, for duckling, with 14 per cent, the proportion of building material and fuel furnished to the body might be noticeably changed. But too much importance should not be put on the differences between closely related birds, such as chicken, capon, and turkey, for they are too slight to affect seriously the nutritive value of the diet under ordinary circumstances. Moreover, the greater nutritive value which one kind seems to possess may be counterbalanced by greater losses in cooking, by leanness or fatness of the individual specimen, or by higher price. The consideration of price is so important that it will be discussed at length in a later section.

[1] U. S. Dept. Agr., Farmers' Bul. 142 (1910).

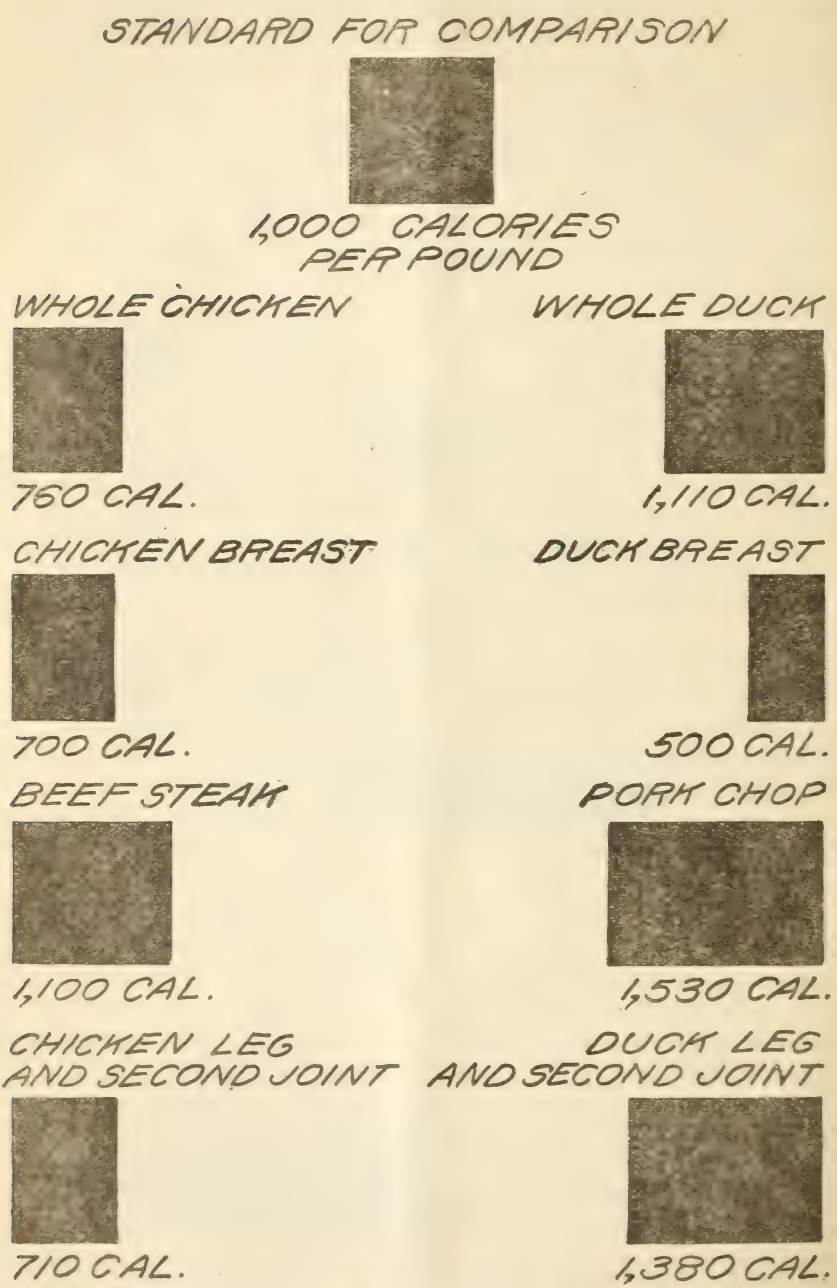

FIG. 2.—The energy value of poultry in comparison with some other foods.

As the figures in the table and the diagrams in figure 2 show, poultry has an energy value much like that of other flesh foods, and, like that, varying with individual kinds; chicken, for example, averages less energy value per pound than duck, owing to the fact that it is usually less fat. In chicken the light and dark meat have much the same energy value per pound, while in duck the leg and second joint have a higher energy value than the breast, being almost equal to pork chop in this respect.

DIGESTIBILITY AND HEALTHFULNESS.

There is a popular idea that different kinds of poultry vary considerably in digestibility or healthfulness. Such ideas, it may be said in passing, most often refer merely to the behavior of food in the stomach—whether or not it leaves that organ quickly and without causing discomfort—and take no account of the equally important intestinal digestion. In the case of poultry of different kinds, scientific investigation indicates that there is much less difference than is commonly supposed, and that nearly all of the nutrients and energy of poultry, as of other meats, are utilized by the healthy, normal body.

Such a statement does not take account of the ease and quickness of digestion nor of the effect that some of the characteristics of the different meats might have in certain forms of disease, and these considerations must be borne in mind in discussing the value of different kinds of foods in special cases.

For example, it has been said that poultry, veal, and lamb are more healthful than red meats (beef), because the so-called "light" meats contain less of certain nitrogenous extractives supposed to be harmful in rheumatism, gout, and certain kidney diseases. Recent investigations indicate that the differences in this regard between the two classes of meat are inconsiderable, and that they are quite as much in favor of the red as the light meats.

There is also a theory that the light meat of chicken, turkey, etc., is more easily digested, because more tender, than the dark. A glance at the figures for chicken and turkey, in the table, will show that the light meat of these birds, and especially of turkey, contains more protein and less fat than the dark, and that, since fat is sometimes less easily digested than protein, they may yield more nourishment for the same amount of digestive effort. Very likely the popular idea that the breast of duck is much more digestible than other parts of the bird may be explained by the fact that it contains 5 per cent more protein and 24 per cent less fat than the other parts. These differences in nutritive value seem to depend on the chemical composition rather than on the texture of the fibers, and are not ordinarily of practical importance.

Not much is accurately known regarding the digestibility of poultry cooked in different ways, but there is little reason to suppose that the differences are great enough to be of significance to healthy persons. In some recent experiments with man it was found that boiled chicken left the stomach more quickly than roasted. This does not indicate that the boiled chicken was more thoroughly digested, but merely that it was more quickly acted upon by the digestive mechanism of the stomach, and that, therefore, it might be a more desirable form for persons suffering from gastric indigestion. Fried chicken, like fried foods in general, has the reputation of causing more digestive disturbance than that cooked in other ways. It is not yet definitely known to what extent this is true, or, if true, the reason for it. One suggested explanation is that the layer of fat surrounding the food prevents the gastric juice from acting on it and delays digestion until the fat itself is acted upon in the intestine; another is acrolein if developed in overcooked fat is irritating to the lining of the digestive organs, just as in the fumes from burning fat it irritates the eyes and throat.

One occasionally hears of poisoning from chicken pie. Many persons believe that such trouble is due to the fact that the pie was baked without having holes made in the crust, but this theory seems to have no foundation. In an experiment in this office in which two pies exactly similar except that one was made with an unpierced and the other with a pierced crust, were baked at the same temperature, it was found that they lost equally in weight during baking, cooled at practically the same rate, and were in every way identical except that less juice ran out of the one with the pierced crust. Undoubtedly there are occasional cases of chicken-pie poisoning, but they are probably no more common than poisoning from other "made" dishes, including some which contain no animal food. All such poisoning is due to microorganisms which have accidentally gained access from dust, dirty fingers, or in some similar way. They may have withstood the heat of cooking or entered the food after it left the oven. In chicken pie, the meat might have become infected between the first cooking and the time the pie was made. Fortunately such poisoning can be prevented by care and cleanliness in handling the food.

COST OF POULTRY.

The cost of poultry, like that of all meats, has been rising more or less steadily during the last few years, but as no complete records are kept of the market prices of different varieties, it is hard to make accurate statements regarding the actual price. The only definite figures found are those for chickens, collected by the Bureau of Labor Statistics. For the year 1914 the retail price of chickens of good quality, marketed dressed, ranged from 15 to 28 cents per

pound. It was lowest in the late autumn and early winter, and highest in midsummer, extremes which seem to be in close relation to the natural supply. The price of live chickens was slightly lower, but not enough so to make it worth while for the ordinary householder to buy birds alive merely on this account.

Local conditions still have influence on retail prices, especially where retailers or housekeepers buy directly from the breeders, and probably home-grown poultry is somewhat cheaper in the Southern States, where less care is required, and in the Central States, where chickens are kept in great numbers, than in other parts of the country.

Even at the same place and time the retail prices of birds are very variable. If a dealer keeps an attractive looking shop, well supplied with perishable, fancy, and out-of-season goods, and is ready to deliver them anywhere at a moment's notice, he must, other things being equal, charge more than a neighboring one who keeps a less expensive stock and sends his delivery wagon on its rounds only once or twice a day. Each purchaser must decide for himself whether or not he can afford to pay for the extra convenience and range of choice of the more expensive market. He will, however, always find it good economy to trade only in markets which have ample facilities for caring for their stock and which are kept scrupulously clean.

It is almost impossible to estimate what relation retail prices bear to the current wholesale prices, but they may occasionally run as high as twice the latter. Of course, in the country, especially from farms where poultry raising is a secondary affair, good birds can sometimes be bought for little more than the wholesale prices.

The less common kinds of poultry, such as squab and pheasant, which are still raised only in small numbers and often at considerable cost and risk, are naturally expensive beyond all comparison with the standard kinds.

Although the market price is the most important factor in determining whether poultry is a cheap or a dear food, it is not the only one, and the real cost of poultry as food depends not on its price per pound, but on the price paid for its actual nutrients. Judged by this standard, well-grown, moderately fat birds are more economical at a given price per pound than either very young or very fat ones. (See p. 28.)

In general, it may be said that low-priced chicken, turkey, goose, pigeon, and guinea fowl are as economical as medium-priced beef and mutton. Chicken and turkey at out-of-season prices, capon, duck, duckling, and green goose are more expensive, while pheasant, quail, and squab are among the most expensive of all meats.

SUMMARY.

Chicken is by far the most common kind of poultry in the United States, but capon, turkey, duck, goose, and squab are also often used for food, while guinea fowl, pheasant, pigeon, quail, and partridge are fairly well known. In all of them table quality depends primarily on tenderness and flavor, and these, in turn, are influenced by age, sex, exercise, food, and care. Freshness is also an important factor, but this is not merely a question of how long a bird has been dead, but rather of how far developed are the chemical and bacteriological changes which, when they are carried too far, cause what we call spoiling or decomposition in the meat. The microorganisms which cause dangerous changes are likely to be introduced by careless and dirty handling, and for this reason cleanliness should be insisted on. The changes take place most rapidly in the presence of warmth and moisture. Hence cleanliness, cold, and dryness are at the bottom of all the methods of caring for poultry on the farm, in the warehouse, at the market, and in the home.

The methods of cooking poultry are, in general, the same as those for other kinds of meat. The tougher the bird, the more cooking will be needed to make it tender and easily digested, and the larger it is, the more heat will be required to cook it thoroughly. Canned and potted poultry are prepared in much the same way as freshly cooked dishes, then sterilized and sealed, and when properly put up do not differ essentially in food value from similar fresh foods.

As regards composition, poultry does not differ as much as is commonly supposed from other meats. Individual kinds and specimens, of course, vary in the relative amounts of inedible material or of protein and fat contained, and there are certain flavors present in poultry which differ from those in other meats; but these differences are not important in ordinary diet. The difference in digestibility between poultry and other meats or between various kinds of poultry is very slight. The latter probably depends largely on the amount of fat contained, the fatter sorts being, perhaps, less easily digested, but the distinctions are unimportant for healthy persons.

The relative cost of different kinds of poultry depends primarily on the price, but also on the proportion of edible to inedible material and the thoroughness with which the edible portions can be utilized. Well-grown birds with good-sized masses of moderately fat flesh are more economical than either young or over-fattened ones. At ordinary retail prices, full-grown chicken is the only poultry which compares in real economy with the cheaper cuts of beef and pork, but young chicken, medium-sized turkey, goose, and guinea fowl are often as economical as the more expensive grades of other meats. When the birds can be obtained for little more than the cost of care and feeding, as sometimes happens on farms, they are, of course,

much more economical. In any case where the price allows them to be used, they furnish a pleasant and wholesome means of varying the meat dishes in the ordinary diet.

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